



## The role of the *Ina-SDI* in supporting the development of the geospatial industry in Indonesia

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### Abstract

In the past, geospatial data and information systems were developed for a nation's security purposes, but nowadays they are utilized to augment its prosperity. Accordingly, the development of geospatial information and communication infrastructure has become imperative to provide the ease and speed of geoinformation access, as well as to reduce redundancy. In this vein, the Indonesian government (GoI) has established the Ina-SDI (Indonesian GeoSpatial Data Infrastructure) under the Presidential Regulation Nr. 85 year 2007, following which the BAKOSURTANAL (National Coordinating Agency for Surveying and Mapping) received a mandate from the GoI to coordinate the development of Ina-SDI operational model which is to be actualised within two years under the Ina-SDI Development Project. This article embarks on an exploratory assessment of the development of Ina-SDI. The conclusion is that the success of the Ina-SDI is dependent on the completion of a nationwide standardized based map, the integration of all Ina-SDI geospatial data and information players, the support for ease and speed of data and information accessibilities through integrated ICT infrastructures, and the provision and enforcement of laws and regulation to enable the Ina-SDI to take off from a 'rowing' to a 'steering' role in order to lend support to the country's geospatial commerce and industry.

**Keywords:** geospatial data and information systems, geospatial industry, ICT infrastructures, ICT integration, ICT network, standardized based map

### Introduction

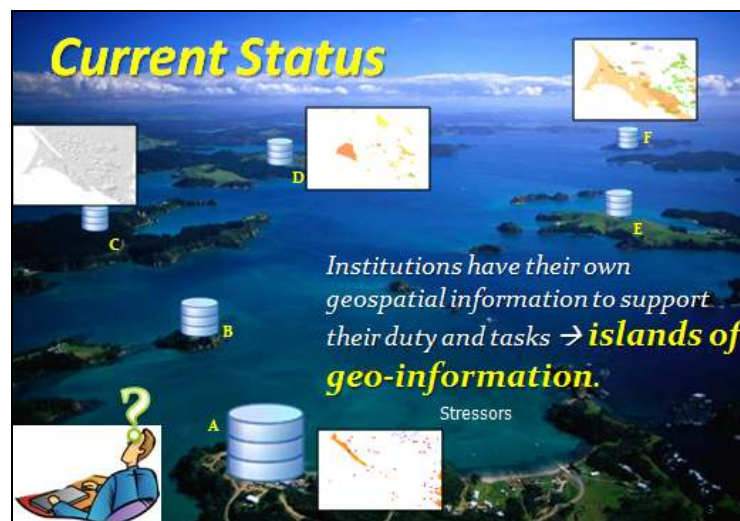
According to the Act Number 25/2004 about the National Development Planning System (Anonymous, 2004), all of the development activities must be planned based on spatial or non spatial data and other information accurately and reliably. Other Act, Act Number 32 2004 about local governance (Anonymous, 2004) the development done by the local governments must be based on data and information, spatial or non spatial, and the local governments must develop local information system that can be integrated nationally. Furthermore, spatial aspect must be integrated into or within the development planning framework at all levels of government. In this specific case, there are 33 provinces and about 500 regencies or municipalities that must be integrated. Those three Acts have clearly indicated the importance of spatial data in the development planning processes.

Spatial or geospatial data and information is not only used for government activities like mandated by those Acts above, but also many applications such as for disaster management, natural resources management, and economic business development in general (Figure 1). Those have involved not only government but also private sectors as well as public.



**Figure 1.** Utilization of geospatial information in Indonesia

Nowadays, most of institutions at state or local levels have great understanding of how importance geospatial data are. On the other hand, the procurement of geospatial data is generally expensive and time consuming. For that reason, some institutions are willing to spend much money and other resources, but the lack of communication and coordination with geospatial data producers causes redundancy and duplication. Meanwhile institutions that have less resources choose to conduct activities without adequate data. Other problems arose when problem solving needed inter sectors data. In this case, it is very common to be difficult to get appropriate data and even when the data are available, the issues or problem of integrating data would occur. This is what we usually call the geo-information islands (Figure 2).



**Figure 2.** Current status of geospatial information: Geo-Information Islands

Anonymous (2010) stated that since geospatial information often involves a significant financial investment, many governments coordinate their efforts to produce cost-savings, improve quality of services and increase efficiency. Hence, under the basic premise “build it once, use it many times”, clearly more could be done.

Therefore, there is a need for a framework the integrated national geospatial information to develop the National Spatial Data Infrastructure (NSDI). Each sector can no longer think of how to fulfill data by and for them. Folger (2009) said that the federal government’s role has changed from

being a primary provider of authoritative geospatial information to coordinating and managing geospatial data and facilitating partnerships. Communication and coordination between sectors are needed so that the redundancy and duplication of geospatial data can be minimized.

Further Anonymous (2010) stated that through coordination, benefits can be enhanced and expanded. The NSDI platform will provide the means to enhance and expand these capabilities by offering an operational focal point for delivering trusted geospatial data, services, and applications that can be accessed and used by multiple organizations.

The main challenge of the NSDI development is to improve the utilization of geospatial data and information that have well-defined spatial references to support the many kinds of decision makings effectively, efficiently and accessibly. Further, the geospatial data can be easily and readily exchanged and integrated horizontally or vertically.

The development of spatial data infrastructure has vision to provide the accurate geospatial data which available on a local, national and global basis for contributing to economic growth, environmental quality and stability and social progress, DeLoatch (2009). Hence, the main challenge of the NSDI development is to improve the utilization of geospatial data and information that have well-defined spatial references to support the many kinds of decision makings effectively, efficiently and accessibly. Further, the geospatial data can be easily and readily exchanged and integrated horizontally or vertically. DeLoatch (2009) stated that the NSDI “assures that spatial data from multiple sources (federal, state, local, and tribal governments, academia, and the private sector) are available and easily integrated to enhance the understanding of our physical and cultural world”.

## **Ina-SDI: Indonesia Spatial Data Infrastructure**

### *Why Ina-SDI?*

With the proliferating complexity of the national development tasks, the need for geospatial information can hardly be overstated as basic utilities for coordination (Figure 3). This geospatial information would also require regular maintaining, updating of information and the security thereof. The logical step forward would be the development of the National Geo-spatial Data Infrastructure (NSDI), which will become foundation for the future National Geo-spatial Information System (NSIS). By developing the NSDI, it is intended to create environment in which stakeholders, using its technology, standards and the shared geospatial information, can cooperate and intersect with each other to better achieve their objectives at different political or administrative levels. On the 3rd of August 2007, the Regulation of The President of the Republic of Indonesia No.85/2007 took effect for the implementation of the Indonesia NSDI Networking System.

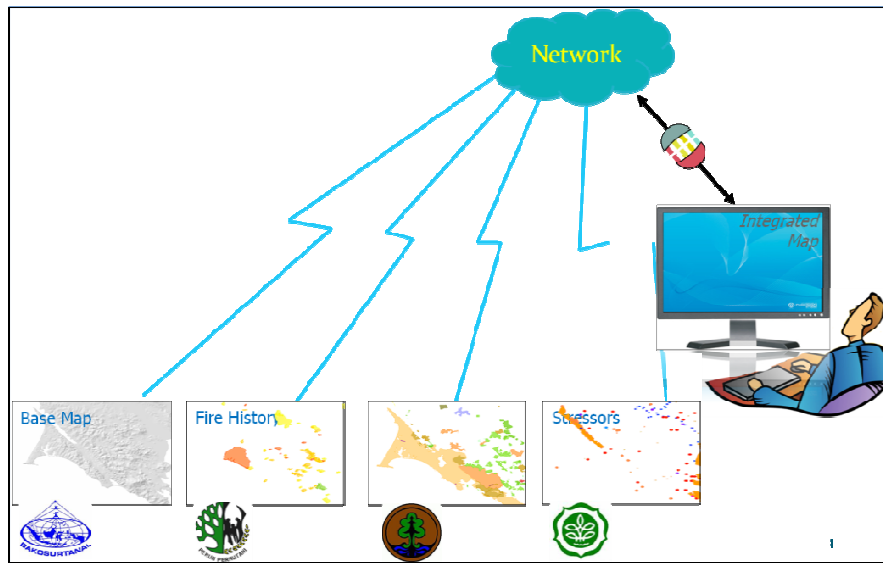
The term Ina-SDI is necessary to avoid the general term of NSDI, which has been too commonly used worldwide. Maguire and Longley (2004) declared that there are similar initiatives in Europe, such as the EU wide INSPIRE (Infrastructure for Spatial Information in Europe) project and in Asia, such as the Australian SDI, and Indian SDI . Meanwhile, Ina-SDI is specific to Indonesia, and this term will be used through this article.

This intention is deemed necessary as a means to operate the Geographic Information System (GIS) which is an important tool for the decision-makers' decisions on the formulation, implementation, and monitoring and evaluation of the national and regional development plans, the construction and management of various development projects, infrastructure projects, emergency measures against natural disasters, environmental protection policies, the land use, the cadastral system, forestry management, agricultural management, land and building tax management, statistics management, marine affairs management, mineral resources management and many others. This would also be in pursuance of the policy directions in the Mid Term national Development Planning 2005-2009 to determine the right future actions, through sequence of choices by considering the available resources.

Benefits that can be obtained from the National Geographic Information System are as follows.

- a. The distribution of geospatial information owned by government or non government institutions can be easily known.
- b. Unnecessary overlapping or redundant geospatial information can be avoided.
- c. Quality of geospatial information can be accessed.

- d. Added values are very possible because of the variety of geospatial information provided.
- e. Public can access geospatial information provided and produced by related stakeholders.

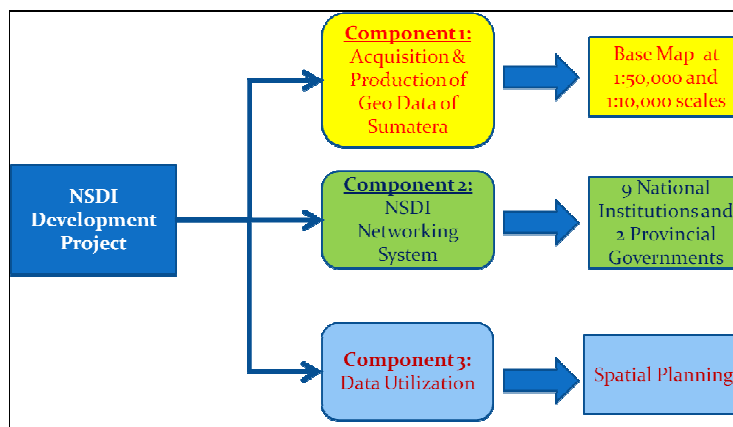


**Figure 3.** *The need for integration through the National Geographic Information System*

#### *On-going project*

The purpose of the Ina-SDI project is to achieve good governance of Indonesian Geospatial Assets. This includes the participating institutions, national, provincial and local governments, non-governmental organizations (NGO). The Ina-SDI will improve or support efficient administrative works, and elimination of duplicated investments and works in the production of geospatial data through Acquisition and Production of Geo-spatial Data of Sumatra Islands, Development of National Geo-spatial Data Infrastructure (NSDI) Networking System and Utilization of Ina-SDI to Support Regional Development Planning for Provincial Governments (Figure 4).

The NSDI project will contribute to the appropriate management of natural resources, protection of environment and migration of national hazard, and ultimately contributing to overall economic development of Indonesia. As stated by Yalcin (2011), the triangle of economic, social and environmental bases goes to good governance which is essential for sustainable development. It is possible to obtain reliable, applicable and effective results, when GIS, under an e-Government/National SDI umbrella, is used; because these processes requires up to date and any related data which is stored in distributed databases. It facilitates decision on any kind of plan.



**Figure 4.** *Ina SDI project components*

The NSDI project will involve various complexities of project management activities not only related to the administrative matters but also to the technical dealing with several government institutes. In particular evaluating, selecting and managing the appropriate geo-information, and communication technologies, applications, and providing for effective technology transfer and trainings. As stated by Folger (2009), the NSDI consist of data themes, metadata, National Spatial Data Clearinghouse, standards, and partnerships. The NSDI Project implementation can be considered successful, if the developed NSDI complies with the NSDI operational concept, uses approved standards and increases the usefulness of NSDI assets.

The goal of the NSDI Distributed Network Node is to reduce duplication of effort among agencies, improve quality and reduce costs related to data and information, to make data more accessible to the public, to increase the benefits of using available data. Its success relies on key partnerships with participating institutes, other national data producers. Provinces, district and local government as well as the private sector will need to increase data availability. Simply speaking, the data and information shall be easily found, accessed and utilized on-line upon NSDI.

The following three key factors will determine if NSDI will be successful: (1) broad participation of data producers and consumers; (2) benefit generating to business and mission consumers; (3) growth in use and participation to create a self sustaining environment.

The NSDI Networking System Development Project is to implement effective governance of national and local government's geospatial data and service assets, improve the efficiency of geospatially dependent administrative operations, improve the awareness and availability of geospatial assets and eliminate the duplication of investments by: (1) providing authoritative and other independent geospatial producers, and all consumers convenient standards based access to well defined and understandable geo-spatial data and metadata holdings; (2) maximize the awareness and reuse of existing geospatial data and services by describing and cataloging them in an interpretable, managed manner; (3) improving the quality and reliability of geospatial data and products and services to ensure greater value in decision making, knowledge creation and other business activities.

#### *Ina-SDI "participating institutes"*

The organizations listed below are actively engaged in the construction of the Indonesian NSDI. They play a crucial role in acquisition, creation and management and delivery of authoritative Indonesian data for significant geographic scope. These institutes are obligated to improve their effectiveness of fulfilling the goals of the NSDI. As participating institutions, they will be key stakeholders and users of the system and beneficiaries of the investment. As a result of the new capabilities, the NSDI "Participating Institutes" will improve data quality, service delivery and efficient use of data management and acquisition resources.

National Coordinating Agency for Surveys and Mapping (BAKOSURTANAL) has seven Spatial Data Production Centers namely, Centre for Land Resources Surveys, Centre for Marine Resources Surveys, Centre for Atlases, Centre for Topographic and Spatial Planning Base Mapping, Centre for Marine and Aeronautical Base Mapping, Centre for Regional Boundary Mapping, Centre for Geodesy and Geodynamics. In addition, BAKOSURTANAL has five administrative and supporting centers such as: Centre for Networking System and Spatial Data Standardization, Center for Services and Information, Bureau of Finance, Personnel and Legal Affairs, Bureau of Planning and Internal Affairs, and Inspectorate.

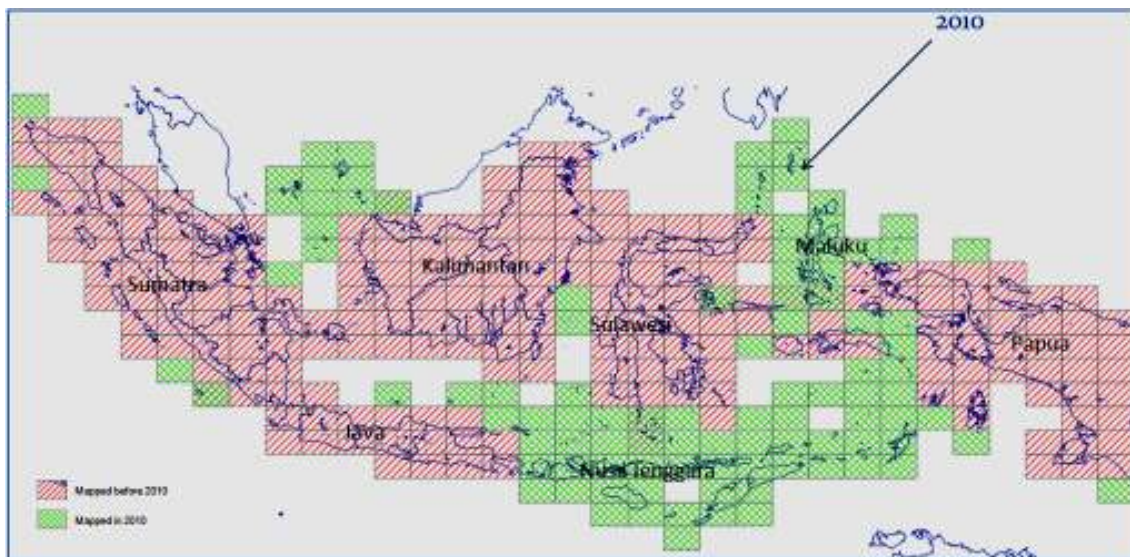
The others institutes which are also engaged in the construction of the Indonesia NSDI are as follows: (1) Ministry of Agriculture: Centre of Soil and Agro-Climate Research; (2) Ministry of Marine Affairs and Fisheries: Directorate of Coastal and Marine Spatial Planning and Small Islands; (3) Ministry of Forestry: Centre of Inventory and Mapping, Forestry Planning Agency; (4) Ministry of Public Works: Data Centre and Directorate of Spatial Planning; (5) Ministry of Energy and Mineral Resources: Centre of Geological Surveys, Geological Agency; (6) Ministry of Environment: Office of Deputy Assistance for Data and Information; (7) Central Bureau of Statistics: Directorate of Statistics Methodology; (8) National Land Agency: Directorate of Base Mapping and Directorate of Thematic Mapping and Data, Information; (9) DKI Jakarta: Land and Mapping Agency; (10) Province of West Java: Regional Planning Board



## Geospatial industry challenge

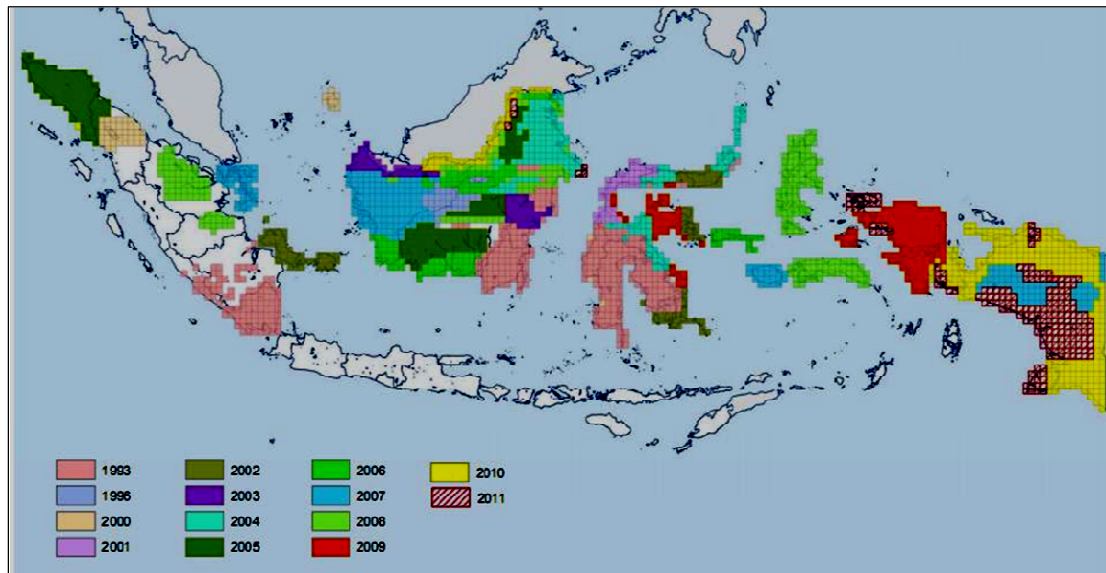
### *Map availability*

One of the main problems faced in Indonesia geospatial information is the completeness and the update of base map. The maps have been programmed to be in several scales 1:1,000,000, 1:250,000, 1:50,000, 1:25,000 and 1:10,000. With terrestrial area of more than 1.9 million kilometer squares, the update and even completeness of map at those given scale are major problems. The following figures illustrate the status of base map availability produced by BAKOSURTANAL. Figure 5 shows the coverage of Indonesian base map in the scale of 1:250,000. The legends with red lines show the maps which have been mapped before 2010. Meanwhile, the legends with the green lines show the maps which have been completed in 2010. The data sources of maps made before 2010 are ranging from 1993 data until 2009. Plenty of them need updating and improving of data quality, such as in Sumatera Region and Kalimantan Region. The updating of those data hopefully can be completed in the fiscal year of 2012.



**Figure 5.** Indonesian base map at 1:250,000 scale

Figure 6 describes the availability status of base map in the scale of 1:50,000. The different colors of legends represent the year of mapping completeness. Some parts of Sumatera need to be mapped meanwhile Jawa and Nusa Tenggara have been mapped in the scale of 1:25,000



**Figure 6.** Base map of Indonesia at 1:50,000 scale

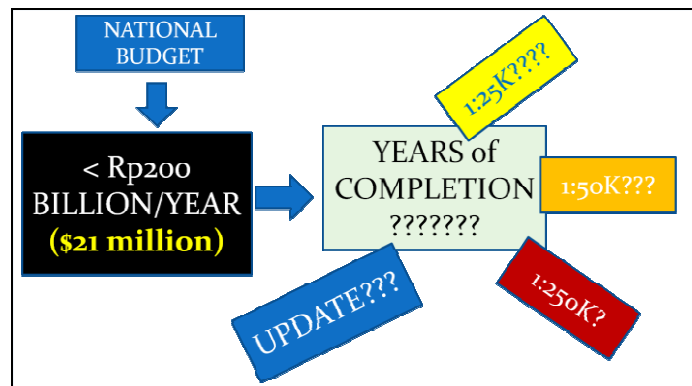
Figure 7 illustrates the various scale of Indonesia Base Map. The different colors of legends represent the various scales of the available maps. Both physical and non-physical conditions have been the cause of the problems. As located within the tropical zone in equatorial zone, Indonesia faces the common problem of cloud. Data acquisition that relies of optical remote sensing will find this hard to avoid. Active remote sensing using radar has been the choice but besides its high cost, the methodology to extract land covers and other features is still under many researches.



**Figure 7.** Base map of Indonesia at 1:10,000, 1:25,000 and 1:50,000 scales

#### *Map completion challenge*

Other than technological aspects of mapping, problem with base map completion at various scale is considered classical, funding. Assuming that the annual budget for base mapping in Indonesia is about 21 million dollars then the would be more than 20 years to complete the map with current resources (Figure 8). This is considered very slow, while the demands require fast updating and completion.



**Figure 8.** Annual budget for base map completion

Therefore, there is a need for new strategic approaches to deal with such problem. For example, completion can be done not based on map sheets, but maybe, can be done based on layers. The most expensive data production for base map is the digital elevation model, which can consume more than 75% of the total base mapping budget. Knowing how demands on base map increase significantly, the problem should be considered as national issue in which base map completion should be brought along any mapping project. This requires good cooperation among the government institutions themselves.. Another layer -- as a part of geospatial fundamental data that is needed for various stakeholders-- is orthoimagery. For comparison, Folger (2009) in the CRS Report for Congress, the United States, suggested the need for detailed resolution orthoimagery (one meter) available for the entire national territory each year. While in Japan, digital ortho images already available which can be accessed via internet Tachibana, (2009).

### Policy on geospatial activities

As already mentioned in the beginning of the paper, there are many regulations and acts that require geospatial information for government activities. Geospatial information is essential for social, economic and political decisions. McDougall et al. (2007) said that in emergency situation for disaster management there is a good cooperation between local, state and national jurisdictions, but at other time the sharing of data has been problematic. Studies indicate that there are more 170 regulations in the form of Acts that deal with approximately 93 kinds of geospatial information. Considering the number of geospatial information mentioned, one should considered how those data and information can be fitted into one reference mapping system.

There should be coordination between institutions producing the geospatial information. One of efforts for integration is the announcement of Presidential Regulation number 85 year 2007 regarding the National Spatial Data Networking, where 14 institutions have identified their fundamental data set for their activities. This Presidential regulation has lead to the development of Ina-SDI mentioned above. The joined network does not limit the participating government institutions or private sectors since partnerships are considered to be important for SDI development. They give a mechanism to allow organizations to work together to achieved SDI goals and share implementation responsibilities and the eventual partnership benefits (MCDougall et al., 2007).

Since nineties, BAKOSURTANAL had initiated an Act for Geospatial Information. The proposed Act was initially called the National Geographic Information Order. But after 2010, the name was changed to Act about Geospatial Information. Geospatial Information Act Number 4/2011 (Anonymous, 2011) declared by the President of Republic of Indonesia on 21 April 2011 with the main objective to set up one base map for all and to gain the involvement of professional, association and private sectors in geospatial information related activities. With this proposed Act, it is expected that the geospatial industries will grow faster than before, compete fairly and support the development of geospatial activities nationally. With this condition, there should be a change in government, and private sectors role mentioned in the following section. From December 2011, after



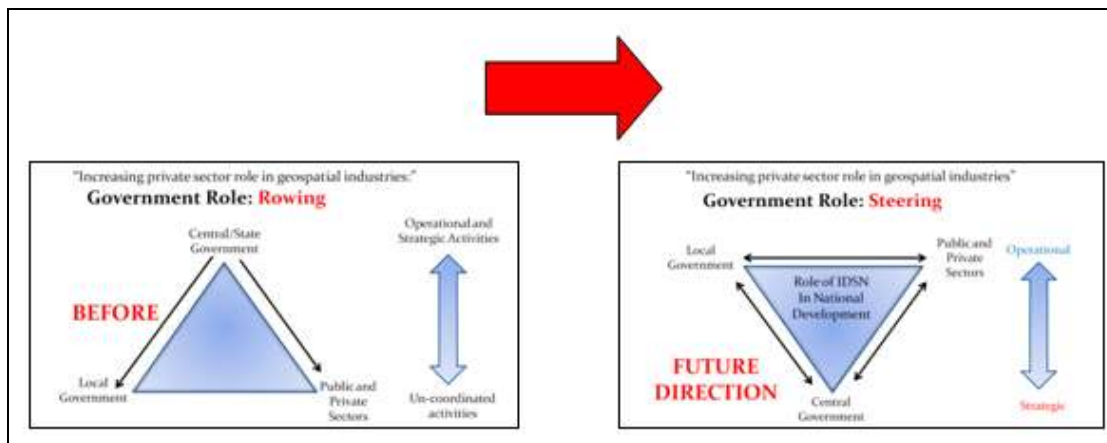
the signing of Presidential Decree Number 94/2011 (Anonymous, 2011), BAKOSURTANAL is replaced by Geospatial Information Agency, which has a wider function and tasks.

## Business model

### *Shifting government role from rowing to steering*

To be successful in the implementation of Ina-SDI, public and local governments will have great role in accessing and utilizing the geospatial information provided by state government institutions. Therefore, public will put a great demand to state or local government to be able to access geospatial data and information easily and fast. Government role for being the map maker should change to put themselves in a position where geospatial data and information can be much useful to public in a controlled manner. In other words, the government role should be shifted from rowing to steering (Figure 9). Hence, the utility of geospatial data and information can support greatly the national development process, not just for the use of each government institution for their duties and operations.

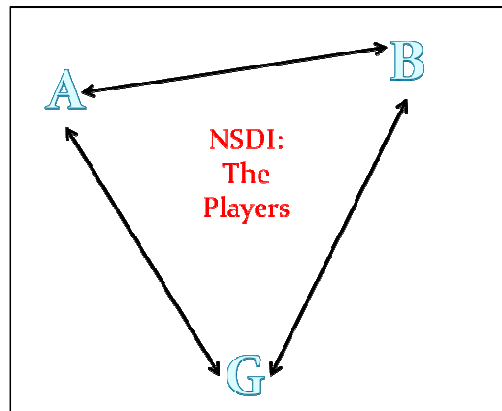
However, one should control the utilization to be in appropriate manner. Public should be educated well, private sectors should be accommodated and regulated, issues like copyright, human resource competence and skill should be accommodated and protected well.



**Figure 9.** *The shift of government role from rowing to steering*

### *The players*

As the role of government shifted from rowing to steering, the success in Ina-SDI relies on several players: Academics, Business, Government as well as NGO and public (Figure 10). Academics play the role in preparing high quality human resources, business will play in providing such technologies and skill labours, government as mentioned earlier will play important role to set up strategic plan, regulation and appropriate means for protecting each component's role. The three players are the traditional model, and in the modern era the role of NGO and public must be considered because they are not only the market for geospatial information, but also the factors that can determine the demands of geospatial information. Cowen (2009) mentioned further that the government can no longer think of themselves as a player outside of, or immune from private sector, state, local or even public stakeholders. Collaboration between stakeholders is needed for improving the availability and the quality of geospatial data.



**Figure 10.** *Academics, business and government*

## Conclusion

The success of the Ina-SDI is dependent on the completion of a nationwide standardised based map, the integration of all Ina-SDI geospatial data and information players, the support for ease and speed of data and information accessibilities through integrated ICT infrastructures, and the provision and enforcement of laws and regulation to enable the Ina-SDI to take off from a ‘rowing’ to a ‘steering’ role in order to lend support to the country’s geospatial commerce and industry.

## References

- Anonymous (2004) Republic of Indonesia Act Number 25 year 2004 about the National Development Planning System. The Government of Republic of Indonesia., Jakarta.
- Anonymous (2004) Republic of Indonesia Act Number 32 year 2004 about Local Governance. The Government of Republic of Indonesia, Jakarta.
- Anonymous (2007) Presidential Regulation Number 85 year 2007 about National Spatial Data Networking. The Government of Republic of Indonesia, Jakarta.
- Anonymous (2009) BAKOSURTANAL Strategic Plan 2009 - 2014. BAKOSURTANAL. The National Coordinating Agency for Survey and Mapping, Cibinong.
- Anonymous (2010) Modernization roadmap for the geospatial platform. Geospatial Platform, U.S Department of the Interior and Federal Geographic Data Committee: p.59.
- Anonim (2011) Republic of Indonesia Act Number 4 year 2011 about Geospatial Information. The Government of Republic of Indonesia, Jakarta.
- Anonymous (2011) Presidential Decree Number 94 year 2011 about the Geospatial Information Agency of Indonesia. The Government of Republic of Indonesia, Jakarta.
- Cowen D (2009) The changing geospatial landscape: A report of the National Geospatial Advisory Committee. *Photogrammetric Engineering & Remote Sensing*, pp. 747-750.
- DeLoatch IB (2009) The U.S. Federal Geographic Data Committee (FGDC) Story, Federal Geographic Data Committee, p.27.
- Folger P (2009) Geospatial Information and Geographic Information Systems (GIS): Current Issues and Future Challenges, Congress Report Service.
- Maguire DJ, Longley PA (2004) The emergence of geoportals and their role in spatial data infrastructures. *Computers, Environment and Urban Systems* 29, 3–14.

- MCDougall K et al. (2007) A mixed-method approach for evaluating spatial data sharing partnerships for spatial data infrastructure development. *Research and Theory in Advancing Spatial Data Infrastructure Concepts*, pp. 55 - 73.
- Tachibana Y (2009) New NSDI and National Mapping Policy of Japan, Eighteenth United Nations Regional Cartographic Conference for Asia and the Pacific, Bangkok, 26-29 October 2009.
- Yalcin G (2011) Geo-metadata in spatial data infrastructure and e-governance. *African Journal of Business Management* 5 (12), 4650-4656.